CLAIMS

1. An infusion device for medical use, comprising:

- at least one container (4) designed to hold a specified quantity of a liquid to be infused into a patient;
- a weighing device (7) associated for operation with the said container to measure the weight of the container and emit a corresponding control signal;
- a transport line (2) connected to the said container to convey the liquid, in operating conditions, towards an infusion point (5);
- means (9) for moving a flow of the liquid along the said line;
- a control unit (8) associated with the said weighing device and with the said movement means, the control unit receiving the said control signal and being capable of detecting at least one end of infusion condition;

the said infusion device being characterised in that it comprises a continuous fluid separator (10) capable of separating the fluid into a gaseous portion and a liquid portion, the said separator (10) operating in the said transport line (2).

2. The device of Claim 1, characterised in that the said separator comprises a containing body (11) having:

- at least one inlet (12) for receiving a fluid from the said container;
- at least a first outlet (13) for receiving a liquid portion of the said fluid;
- selector means (15) interposed between the said inlet and the said first outlet and capable of continuously separating the said fluid into a gaseous portion and a liquid portion.

3. The device of Claim 2, characterised in that the said containing body (11) of the separator comprises at least a second outlet (14) for receiving the said gaseous portion of the said fluid.

4. The device of Claim 2 or 3, characterised in that the said selector means comprise at least one hydrophilic membrane (16) having one side facing the said first outlet and one side facing the said inlet, for receiving the said fluid and transferring only liquid towards the said first outlet.

5. The device of Claim 3 or 4, characterised in that the said selector means comprise at least one hydrophobic membrane (17) having one side facing the said second outlet and one side facing the said inlet, for receiving the said fluid and transferring only gas towards the said second outlet.

6. The device of any one of Claims 1 to 5, characterised in that the said separator (10) is interpositioned between the said movement means (9) and the said infusion point (5).

7. The device of any one of Claims 1 to 6, characterised in that the said separator (10) is positioned immediately downstream of the said movement means (9).

8. The device of any one of Claims 1 to 7, characterised in that it comprises a rigid support (1) holding opposite ends of a first length of tubing (18) of the said line (2) designed to interact with the said movement means (9), the said first length of tubing having a curved shape and a predetermined axial extension.

9. The device of Claim 8, characterised in that the said line (2) comprises a second length of tubing (19) extending between the said container (4) and the said rigid support (1) and put into fluid communication with the said first length.

10. The device of Claim 8 or 9, characterised in that the said rigid support (1) comprises a first lateral portion (20) forming the said containing body (11).

11. The device of Claim 10, characterised in that the said rigid support (1) comprises a second lateral portion (22) with a tubular profile to which are fixed corresponding ends of the said first and the said second length of tubing of the said line (18, 19), the said second lateral portion being distanced from the said first portion (20).

12. The device of any one of Claims 3 to 11, characterised in that the said containing body (11) comprises a base (25) and a cover portion (26), interacting with one other to form a passage (27) for fluid between the said inlet (12) and the said first and second outlets (13, 14).

13. The device of Claim 12 and of any one of Claims 5 to 11, characterised in that the said base (25) forms a through channel (28) for putting the said passage (27) into fluid communication with the exterior, the said hydrophobic membrane (17) operating in the said channel.

14. The device of Claim 12 or 13, characterised in that the said base (25) comprises an incorporated first tubular connecting element (29).

15. The device of Claim 14, characterised in that the said cover portion (26) comprises an incorporated second tubular connecting element (30) having an axis of extension which is inclined with respect to an axis of extension of the said first tubular connecting element.

16. The device of Claim 12 and to any one of Claims 4 to 11, characterised in that the said hydrophilic membrane (16) is interpositioned between the said base (25) and the said cover portion (26), and extends throughout the said containing body (11).

17. The device of Claims 12 and of any one of Claims 4 to 11, characterised in that each of the said base (25) and the said cover portion (26) comprises a corresponding base wall (25a; 26a) and a corresponding perimeter edge (25b; 26b) emerging from the said base wall, the said hydrophilic membrane (16) extending parallel to the said base walls (25a; 26a) and distanced there-from.

18. The device of Claim 17, characterised in that the said containing body has a plurality of projections (31) emerging from the said base wall of the said base.

19. The device of Claim 17 or 18, characterised in that the said containing body has a plurality of projections (32) emerging from the said base wall of the said cover portion.

20. The device of Claim 18 or 19, characterised in that the said base projections (31) comprise teeth distributed uniformly over the surface of the said base wall of the said base.

21. The device of Claim 19 or 20, characterised in that the said cover portion projections (32) comprise deflectors spaced angularly to guide a flow of liquid towards the said first outlet.

22. The device of Claim 11, characterised in that the said first and second lateral portion (20, 22) are rigidly connected by a rigid cross-piece (23).

23. The device of Claims 22 and 12, characterised in that the said base (25) of the said containing body, the said rigid cross-piece (23) and the said second lateral portion (22) are made in a single piece.

24. The device of Claim 22 or 23, characterised in that the said rigid cross-piece is essentially flat and parallel to a lie plane of the said first length of tubing.

25. The device of any one of Claims 1 to 24, characterised in that the said control unit (8) is capable of performing an appropriate end of infusion procedure when an end of infusion condition is detected.

26. The device of Claim 25, characterised in that the said end of infusion procedure comprises a stage of commanding the said movement means (9) to stop transport of said fluid along the said line.

27. The device of Claim 25, characterised in that the said end of infusion procedure comprises a stage of signalling that the end of infusion condition has been reached.

28. The device of any one of Claims 1 to 27, characterised in that it comprises a plurality of the said containers (4), the said transport line (2) exhibiting a plurality of branches for fluid connection of each container to the said infusion point, and a corresponding flow shut-off element (6) acting on each of the said branches.

29. The device of Claim 28, characterised in that the said control unit (8) is capable of performing an appropriate end of infusion procedure when the end of infusion condition is detected, the said end of infusion procedure comprising the stage of commanding the opening of a shut-off element (6) associated with a container which is not empty.

30. The device of any one of the preceding claims, characterised in that it comprises at least one check valve (36), predisposed on the said transport line (2) to prevent a flow which is inverse to an infusion direction.

31. The device of claim 30, characterised in that the said check valve (36) is arranged between the said continuous fluid separator (10) and the said infusion point (5).

32. The device of claim 31, characterised in that the said check valve (36) is arranged immediately downstream of the said continuous fluid separator (10).

33. The device of claim 30 and of claim 8, characterised in that the said check valve (36) is an integral part of the said rigid support (1).

34. The device of claim 30 and of claim 2, characterised in that the said check valve (36) is arranged internally of the said containing body (11) in a zone comprised between the said selector means (15) and the said first outlet (13).

35. The device of claim 30, characterised in that the said check valve (36) comprises a mobile obturator organ (37), which operates on a passage mouth (35) of the said liquid portion.

36. The device of claim 35 and of claim 12, characterised in that the said passage mouth (35) is associated to the said cover portion (26) of the said containing body (11).

37. The device of claim 36, characterised in that the said cover portion (26) comprises a base wall (26a) and wherein the said selector means (15) comprise at least one hydrophilic membrane (16) facing and distanced from the said base

wall (26a), the said passage mouth (35) being associated to the said base wall (26a).

38. The device of claim 5, characterised in that the said containing body (11) internally defines a fluid passage (27) between the said separator inlet (12) and the said first outlet (13), the said hydrophobic membrane (17) being situated in an upper zone of a fluid passage portion (27a) located upstream of the said hydrophilic membrane (16), the said hydrophobic membrane (17) facing upwards in a use configuration of the said support element (1).

39. The device of claim 38, characterised in that the said upstream passage portion (27a) for fluid passage has at least one passage section which progressively increases in a direction towards the said hydrophobic membrane (17).

40. The device of claim 39, characterised in that the said hydrophobic membrane (17) is located superiorly with respect to an upper point of the operative surface of the said hydrophilic membrane (16).

41. The device of claim 11, characterised in that the said containing body (11) has a development which is prevalently in a transversal direction proceeding from the said first lateral portion (20) to the said second lateral portion (22), the said first outlet (13) being located in a lateral end zone of the said transversal development, in proximity of the said second lateral portion (22).

42. The device of claim 41, characterised in that the said second outlet (14) is arranged in an intermediate zone of the said transversal development.

43. An infusion device for medical use, comprising:

- at least one container (4) designed to hold a specified quantity of a fluid to be infused into a patient;
- a transport line (2) connected to the said container to convey the said fluid, in operating conditions, in an infusion direction leading from the said container (4) towards an infusion point (5);

- at least one continuous fluid separator (10), operating on the said transport line (2) and separating the said fluid into a gaseous portion and a liquid portion;
- at least one check valve (36), operating on the said transport line (2) for preventing a flow in an inverse direction to the said infusion direction;
- a rigid containing body (11) having at least one inlet (12) and at least a first outlet (13) for a fluid, inserted in the said transport line (2), which containing body (11) contains the said separator (10) and the said check valve (36), both of which separator (10) and check valve (36) are arranged between the said at least one inlet (12) and the said at least one outlet (13).

44. The device of claim 43, characterised in that the said continuous fluid separator (10) is the separator of any one of claims from 2 to 5 and from 12 to 21.

45. The device of claim 44, characterised in that the said check valve (36) is arranged internally of the said containing body (11) in a zone comprised between the said selector means (15) and the said first outlet (13).

46. The device of claim 43, characterised in that the said check valve (36) comprises a mobile obturating organ (37) operating on a passage mouth (35) of the said liquid portion.

47. The device of claim 44, characterised in that the said passage mouth (35) is associated to the said cover portion (26) of the said containing body (11).

48. The device of claim 47, characterised in that the said cover portion (26) comprises a base wall (26a), and wherein the said selector means (15) comprise at least one hydrophilic membrane (16) which faces the said base wall (26a) and is distanced there-from, the said passage mouth (35) being associated to the said base wall (26a).

49. Apparatus for extracorporeal blood treatment, comprising a device according to any one of the preceding claims.

50. Apparatus according to Claims 49 and 15, characterised in that it comprises an extracorporeal circuit (33) and a blood treatment unit (34) positioned in the said circuit (33), the said second connecting element (30) being directly and removably connected to a connector of the said extracorporeal blood circuit (33) upstream or downstream of a blood treatment unit (34).